

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (currently amended): A tunnel barrier for controlling the movement of ~~an~~ electrons through a thermoelectric material comprising a potential barrier having an indented or protruded cross-section.

Claim 2 (original): The tunnel barrier of claim 1 wherein the depth of indents in said indented cross-section or the height of protrusions in said protruded cross-section is chosen to set a threshold energy value above which the barrier is transparent to electron flow, and below which electron flow is prevented.

Claim 3 (currently amended): The tunnel barrier of claim 1 wherein the depth of indents in said indented cross-section or the height of protrusions in said protruded cross-section is given by the relationship  $\lambda(1+2n)/4$ , where  $\lambda$  is the de Broglie wavelength of said electrons, and where n is 0 or a positive integer.

Claim 4 (original): The tunnel barrier of claim 3 in which n is an integer having a value between 0 and 4.

Claim 5 (original): The tunnel barrier of claim 1 wherein the width of indents in said indented cross-section or the width of protrusions in said protruded cross-section the width is much more than  $\lambda$ , where  $\lambda$  is the de Broglie wavelength.

Claim 6 (original): The tunnel barrier of claim 1 in which said potential barrier comprises an electrical insulator.

Claim 7 (currently amended): A thermoelectric device comprising:

- a) a first thermoelectric material;
- b) a second thermoelectric material;
- c) the one or more tunnel barriers of claim 1.

Claim 8 (currently amended): The thermoelectric device of claim 7 wherein said first thermoelectric material comprises an n-type material, said second thermoelectric material comprises a p-type material, and wherein a tunnel barrier of claim 1 is in electrical contact with an~~the~~ anode of said n-type material and a~~the~~ cathode of said p-type material.

Claim 9 (currently amended): The thermoelectric device of claim 7 wherein said first thermoelectric material comprises an n-type material, said second thermoelectric material comprises a p-type material in electrical contact with said n-type material, and wherein a tunnel barrier of claim 1 is in electrical contact with an~~the~~ anode of said p-type material.

Claim 10 (currently amended): The thermoelectric device of claim 7 wherein said first thermoelectric material comprises an n-type material, said second thermoelectric material comprises a p-type material, and wherein a tunnel barrier of claim 1 is in electrical contact with ~~a~~the anode of said n-type material and a further tunnel barrier of claim 1 is in electrical contact with an~~the~~ anode of said p-type material.

Claim 11 (currently amended): A method for making the thermoelectric device of claim 7 comprising:

- (a) forming an indented or protruded structure on a surface of a first thermoelectric material;
- (b) forming an electrically insulating material over said indented or protruded surface;
- (c) attaching a second thermoelectric material to said insulating material.

Claim 12 (original): The method of claim 11 in which said step of forming an insulating material comprises depositing said insulating material.

Claim 13 (original): The method of claim 11 in which said step of forming an insulating material comprises oxidising said first material.

Claim 14 (original): The method of claim 11 in which said step of forming an indented or protruded structure comprises etching.

Claim 15 (original): The method of claim 11 in which said step of forming an indented or protruded structure comprises ablation.

Claim 16 (new): The tunnel barrier of claim 1 wherein the depth of indents in said indented cross-section or the height of protrusions in said protruded cross-section is in the range 10 –  $100\lambda$ , where  $\lambda$  is the de Broglie wavelength of said electrons.

Claim 17 (new): The tunnel barrier of claim 6 in which said electrical insulator is selected from the group consisting of:  $\text{SiO}_2$ ,  $\text{Si}_3\text{N}_4$ ,  $\text{Al}_2\text{O}_3$  and titanium oxide.

Claim 18 (new): The thermoelectric device of claim 7 in which said first or said second thermoelectric material is selected from the group consisting of:  $\text{Bi}_2\text{Te}_3$ , Sb-doped  $\text{Bi}_2\text{Te}_3$ , Se-doped  $\text{Bi}_2\text{Te}_3$ ,  $\text{Bi}_{1-x}\text{Sb}_x$ , and  $\text{CoSb}$ .

Claim 19 (new): The method of claim 11 in which said insulator material is selected from the group consisting of:  $\text{SiO}_2$ ,  $\text{Si}_3\text{N}_4$ ,  $\text{Al}_2\text{O}_3$  and titanium oxide.

Claim 20 (new): The method of claim 11 in which said first or said second thermoelectric material is selected from the group consisting of:  $\text{Bi}_2\text{Te}_3$ , Sb-doped  $\text{Bi}_2\text{Te}_3$ , Se-doped  $\text{Bi}_2\text{Te}_3$ ,  $\text{Bi}_{1-x}\text{Sb}_x$ , and  $\text{CoSb}$ .